

title: "The impact of environmental shocks on children's schooling in Bolivia" author: "Katya Garcia-Israel" output: html_document: toc: yes df_print: paged pdf_document: toc: yes number_sections: yes

Warning: package 'summarytools' was built under R version 3.6.3

Introduction

Literature Review

Data and Methods

Data

The household data was taken from the social surveys database of the Bolivia National Statistical Institute, using household surveys from the years 2005-2007, 2011-2012. Instituto Nacional de Estadística. (2005). Encuesta de Hogares (2005) [SAV file]. Retrieved from <https://www.ine.gob.bo/index.php/banco/base-de-datos-sociales>

The unit of observation at the individual level, but each individual is identified mainly by the household id.

The flood data is from the years 2005-2012. The unit of observation is municipality, but the data is later combined to make the unit of observation at the department level to make it comparable with the household survey data.

This data can be found at the following website: <http://geosinager.defensacivil.gob.bo/maps/226>. It is associated with a map showing the flood occurrences information spatially, and to get the data in a non-spatial format, the flood layer should be downloaded. It may be downloaded in a variety of different formats, including csv.

Warning: Missing column names filled in: 'X1' [1]

The drought data also spans the years 2005-2012 and shows the frequency of droughts in each municipality by year.

This data can be obtained from <http://geosinager.defensacivil.gob.bo/maps/225>. It is shown on a map with different layers, and the raw data may be downloaded in a variety of different forms, including csv.

Warning: Missing column names filled in: 'X1' [1]

Analysis Variables

The variables used in the final analysis are the variables from the flood and drought summaries, showing the number of occurrences in each department per year. The other variables used are from the household data, showing demographic information as well as the dependent variables related to school assistance and registration. The variables “assist” and “register” tell whether the child is currently registered and attending school, and the variables “grade” and “literacy” give further educational information showing what grade the child is in and whether they can read and write. The variables “urb_rur” and “dept” give geographic information, indicating whether the child's household is located in an urban area or a rural area and in what department of the country they are living. Demographic variables such as age, sex, relation to the head of household, number of household members, and income can be used in the analysis as controls.

Table 1: Variable definitions

Variable name	Description
Attend	Binary variable, 1 = attends school
Register	Binary variable, 1 = registered for school
Work reason	Binary variable, 1 = missing school for work
Lny	Log of income per capita (in Bolivianos/month)
Extr	Binary variable, 1 = below extreme poverty line
Female	Binary variable, 1 = female
Age	Age in years
Child	Binary variable, 1 = is child of head of household
Grandchild	Binary variable, 1 = is grandchild of head of household
Num children	Number of children in the household
Secondary	Binary variable, 1 = in secondary school group
hhhead educ	Years of education of head of household
female hhhead	Binary variable, 1 = female head of household
Floods	Number of flood occurrences per dept per year
Droughts	Number of drought occurrences per dept in current year
Lag floods	Number of flood occurrences per dept in the previous year
Lag droughts	Number of drought occurrences per dept in the previous year
Dept	Department (nine options)
Valleys	Binary variable, 1 = department is in valleys region
Mountains	Binary variable, 1 = department is in mountains region
Plains	Binary variable, 1 = department is in plains region

A tibble: 3 x 3

Groups: child [2]

```
child grandchild n 1 0 0 2234 2 0 1 3584 3 1 0 35218 # A tibble: 4 x 3 # Groups: work_reason [3]
work_reason money_reason n 1 0 0 16176 2 0 1 575 3 1 0 526 4 NA NA 23759
```

A tibble: 11 x 2

```
reason n 1 age 1322 2 distance 218 3 finished 127 4 housework/childcare 241 5 money 578 6 not interested
470 7 other 253 8 sickness/accident/disability 189 9 vacation 13515 10 work 541 11 23986
```

A tibble: 9 x 2

```
dept_factor n 1 Beni 2000 2 Chuquisaca 2301 3 Cochabamba 4535 4 La Paz 7579 5 Oruro 2024 6 Pando
1005 7 Potosi 3492 8 Santa Cruz 3591 9 Tarija 1394 ##Variable Descriptions
```

```
#Empirical Model see the link for math equation help.
```

```
#Results
```

```
## Warning: glm.fit: algorithm did not converge
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

Table 2: Summary statistics (full sample)

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
attend	24,316	0.986	0.116	0.000	1.000	1.000	1.000
register	27,921	0.871	0.335	0	1	1	1
work_reason	3,939	0.137	0.344	0.000	0.000	0.000	1.000
lny	27,921	5.345	1.740	0.000	4.615	6.514	10.755
extr	27,921	0.455	0.498	0	0	1	1
female	27,921	0.493	0.500	0	0	1	1
age	27,921	10.979	3.769	5	8	14	17
child	27,921	0.858	0.349	0	1	1	1
grandchild	27,921	0.081	0.274	0	0	0	1
num_children	27,921	3.572	2.298	1	2	4	18
secondary	24,316	0.297	0.457	0.000	0.000	1.000	1.000
hhhead_educ	27,921	7.445	4.902	0	4	12	23
female_hhhead	27,921	0.199	0.399	0	0	0	1
floods	27,921	13.634	11.913	0	5	17	51
droughts	27,921	3.822	5.091	0	1	4	24
valleys	27,921	0.132	0.339	0	0	0	1
plains	27,921	0.236	0.425	0	0	0	1
mountains	27,921	0.469	0.499	0	0	1	1

Table 3: Summary statistics (rural sample)

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
attend	9,804	0.986	0.117	0.000	1.000	1.000	1.000
register	11,966	0.819	0.385	0	1	1	1
work_reason	2,299	0.139	0.346	0.000	0.000	0.000	1.000
lny	11,966	4.712	1.643	0.000	3.799	5.913	9.270
extr	11,966	0.644	0.479	0	0	1	1
female	11,966	0.483	0.500	0	0	1	1
age	11,966	10.679	3.717	5	7	14	17
child	11,966	0.864	0.342	0	1	1	1
grandchild	11,966	0.082	0.274	0	0	0	1
num_children	11,966	4.091	2.458	1	2	5	18
secondary	9,804	0.217	0.412	0.000	0.000	0.000	1.000
hhhead_educ	11,966	5.176	3.844	0	3	7	20
female_hhhead	11,966	0.150	0.357	0	0	0	1
floods	11,966	11.524	10.268	0	5	15	51
droughts	11,966	3.468	4.722	0	1	4	24
valleys	11,966	0.176	0.381	0	0	0	1
plains	11,966	0.207	0.405	0	0	0	1
mountains	11,966	0.436	0.496	0	0	1	1

Table 4: Full sample probit regression results

	<i>Dependent variable:</i>		
	attend (1)	register (2)	work_reason (3)
floods	0.030** (0.012)	0.000 (190.236)	0.038 (0.079)
flood_secondary	0.005 (0.005)	−0.000 (85.573)	−0.023 (0.046)
flood_lny	−0.005** (0.002)	−0.000 (31.520)	−0.009 (0.014)
droughts	−0.012 (0.017)	0.00000 (354.115)	−0.510 (0.375)
drought_secondary	−0.011 (0.012)	−0.00000 (213.151)	−0.051 (0.156)
drought_lny	0.011*** (0.003)	−0.000 (63.825)	0.089 (0.067)
age	−0.101*** (0.010)	0.00000 (197.678)	0.084 (0.057)
female	0.045 (0.047)	0.00000 (950.283)	−0.687** (0.325)
lny	0.012 (0.030)	0.00000 (543.570)	−0.022 (0.202)
secondary	0.321*** (0.100)	0.00000 (2,104.957)	0.521 (0.718)
child	0.504*** (0.078)	−0.00000 (2,245.556)	−0.651* (0.379)
grandchild	0.461*** (0.111)	0.00000 (2,784.251)	−1.338** (0.675)
num_children	0.026** (0.013)	0.00000 (275.394)	0.115* (0.067)
hhhead_educ	0.035*** (0.006)	0.00000 (107.078)	−0.059 (0.037)
female_hhhead	0.134** (0.060)	0.00000 (1,220.530)	1.144*** (0.335)
Observations	24,316	24,316	334
Log Likelihood	−1,501.344	−0.00000	−59.821
Akaike Inf. Crit.	3,058.689	56.000	175.642

Note:

```
## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

The following tables show the results with the lagged variables for floods and droughts.

```
## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

##Robustness Checks

The following results show a different income specification, the inclusion of the extreme poverty variable instead of the log of income.

```
## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

Table 5: Rural sample probit regression results

	<i>Dependent variable:</i>		
	attend (1)	register (2)	work_reason (3)
floods	0.050** (0.020)	−0.00000 (280.003)	0.381 (27,400.640)
flood_secondary	0.007 (0.009)	0.00000 (167.776)	−0.675 (4,901.912)
flood_lny	−0.008** (0.003)	0.000 (52.113)	−0.107 (3,322.918)
droughts	−0.062** (0.027)	−0.00000 (523.584)	−2.200 (11,051.910)
drought_secondary	0.029 (0.026)	−0.00000 (398.366)	5.736 (27,755.590)
drought_lny	0.020*** (0.006)	0.00000 (107.005)	0.212 (4,788.869)
age	−0.109*** (0.016)	−0.00000 (306.423)	1.452 (13,652.190)
female	0.065 (0.075)	−0.00000 (1,500.784)	−4.340 (53,313.780)
lny	−0.027 (0.048)	−0.00000 (843.727)	1.426 (26,993.280)
child	0.524*** (0.127)	−0.00000 (3,704.485)	−0.736 (87,915.150)
grandchild	0.806*** (0.194)	−0.00000 (4,550.804)	6.872 (105,557.200)
num_children	0.084*** (0.021)	−0.00000 (399.675)	2.606 (10,494.440)
secondary	0.134 (0.162)	0.00000 (3,398.165)	−31.228 (43,813.240)
hhhead_educ	0.068*** (0.013)	−0.00000 (212.313)	1.920 (3,085.416)
female_hhhead	0.165 (0.106)	−0.00000 (2,151.791)	27.463 (46,665.570)
Observations	9,804	9,804	137
Log Likelihood	−605.894	−0.000	−0.000
Akaike Inf. Crit.	1,267.787	56.000	56.000

Note:

Table 6: Urban sample probit regression results

	<i>Dependent variable:</i>		
	attend	register	work_reason
	(1)	(2)	(3)
floods	0.018 (0.016)	0.000 (282.048)	0.050 (0.188)
flood_secondary	0.003 (0.006)	0.000 (101.189)	-0.075 (0.081)
flood_lny	-0.003 (0.003)	-0.000 (45.070)	-0.005 (0.029)
droughts	-0.006 (0.023)	-0.000 (527.094)	0.250 (1.175)
drought_secondary	-0.023* (0.014)	-0.000 (253.738)	-0.039 (0.252)
drought_lny	0.011** (0.004)	0.000 (90.527)	-0.044 (0.192)
age	-0.099*** (0.013)	0.000 (259.828)	0.106 (0.088)
female	0.020 (0.063)	0.000 (1,229.795)	-0.335 (0.471)
lny	0.032 (0.042)	0.000 (781.259)	0.015 (0.527)
child	0.526*** (0.102)	-0.00000 (2,838.786)	-1.113* (0.590)
grandchild	0.315** (0.140)	-0.00000 (3,545.218)	-1.714* (0.952)
num_children	-0.015 (0.018)	-0.000 (388.131)	0.241** (0.122)
secondary	0.444*** (0.130)	-0.00000 (2,703.560)	1.286 (1.371)
hhhead_educ	0.024*** (0.007)	0.000 (135.456)	-0.071 (0.053)
female_hhhead	0.159** (0.077)	-0.000 (1,509.883)	0.461 (0.495)
Observations	14,512	14,512	197
Log Likelihood	-853.911	-0.00000	-31.344
Akaike Inf. Crit.	1,763.821	56.000	118.689

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 7: Full sample probit regression results (lagged)

	<i>Dependent variable:</i>		
	attend	register	work_reason
	(1)	(2)	(3)
lag_floods	0.044*** (0.012)	−0.000 (203.571)	0.052 (0.071)
lag_f_secondary	−0.001 (0.006)	−0.000 (112.664)	0.027 (0.033)
lag_flood_lny	−0.005*** (0.002)	−0.000 (34.004)	−0.011 (0.012)
lag_droughts	0.021 (0.014)	0.000 (329.217)	0.301** (0.144)
lag_d_secondary	0.0002 (0.005)	−0.000 (140.396)	0.016 (0.063)
lag_drought_lny	−0.005** (0.002)	0.000 (55.416)	−0.062** (0.026)
age	−0.104*** (0.010)	0.000 (197.695)	0.060 (0.060)
female	0.049 (0.047)	0.000 (950.339)	−0.517 (0.320)
lny	0.096*** (0.035)	0.000 (699.122)	0.701** (0.355)
secondary	0.378*** (0.107)	−0.000 (2,269.085)	−0.269 (0.630)
child	0.502*** (0.078)	−0.000 (2,246.177)	−0.564 (0.394)
grandchild	0.449*** (0.110)	0.000 (2,784.911)	−1.183* (0.629)
num_children	0.030** (0.013)	0.000 (275.404)	0.112* (0.066)
hhhead_educ	0.034*** (0.006)	0.000 (107.411)	−0.075** (0.038)
female_hhhead	0.118** (0.060)	0.000 (1,220.670)	1.041*** (0.324)
Observations	24,316	24,316	334
Log Likelihood	−1,507.649	−0.00000	−58.143
Akaike Inf. Crit.	3,071.298	56.000	172.286

Note:

8 *p<0.1; **p<0.05; ***p<0.01

Table 8: Rural sample probit regression results (lagged)

	<i>Dependent variable:</i>		
	attend	register	work_reason
	(1)	(2)	(3)
lag_floods	0.039** (0.020)	−0.000 (326.717)	−0.157 (8,829.104)
lag_f_secondary	0.010 (0.011)	0.000 (202.801)	0.818 (11,938.570)
lag_flood_lny	−0.005 (0.004)	0.000 (60.468)	−0.100 (9,368.077)
lag_droughts	0.082*** (0.026)	0.000 (465.588)	1.539 (27,093.930)
lag_d_secondary	0.005 (0.009)	0.000 (231.522)	0.365 (15,755.040)
lag_drought_lny	−0.016*** (0.004)	−0.000 (83.691)	−0.250 (2,393.630)
age	−0.111*** (0.016)	−0.000 (306.567)	0.157 (7,099.317)
female	0.087 (0.075)	−0.000 (1,500.659)	−6.166 (84,005.170)
lny	0.089 (0.055)	0.000 (1,042.857)	2.811 (62,775.870)
secondary	0.164 (0.177)	0.000 (3,699.342)	−21.934 (195,822.700)
child	0.528*** (0.127)	0.000 (3,707.175)	2.618 (46,592.650)
grandchild	0.795*** (0.194)	0.000 (4,552.510)	3.985 (43,438.840)
num_children	0.087*** (0.021)	−0.000 (399.338)	2.928 (36,288.320)
hhhead_educ	0.067*** (0.013)	0.000 (213.213)	0.871 (16,289.640)
female_hhhead	0.142 (0.105)	−0.000 (2,150.361)	20.716 (107,222.800)
Observations	9,804	9,804	137
Log Likelihood	−606.602	−0.000	−0.000
Akaike Inf. Crit.	1,269.204	56.000	56.000

Note:

9 *p<0.1; **p<0.05; ***p<0.01

Table 9: Urban sample probit regression results (lagged)

	<i>Dependent variable:</i>		
	attend	register	work_reason
	(1)	(2)	(3)
lag_floods	0.052*** (0.018)	0.000 (281.239)	2.942** (1.347)
lag_f_secondary	−0.008 (0.007)	−0.000 (136.497)	0.942** (0.376)
lag_flood_lny	−0.005* (0.003)	−0.000 (45.882)	−0.466** (0.213)
lag_droughts	−0.011 (0.020)	0.000 (521.328)	3.156** (1.412)
lag_d_secondary	−0.003 (0.007)	−0.000 (177.383)	1.384** (0.692)
lag_drought_lny	0.001 (0.003)	−0.000 (84.384)	−0.651** (0.276)
age	−0.101*** (0.013)	−0.000 (259.769)	−0.093 (0.153)
female	0.023 (0.063)	−0.000 (1,229.379)	−0.120 (0.841)
lny	0.101** (0.050)	0.000 (1,088.220)	9.865** (3.861)
secondary	0.521*** (0.140)	0.000 (2,895.397)	−15.446** (6.199)
child	0.516*** (0.102)	−0.00000 (2,838.928)	−2.573** (1.235)
grandchild	0.290** (0.139)	−0.00000 (3,544.640)	−9.205*** (3.260)
num_children	−0.012 (0.018)	0.000 (388.108)	1.037*** (0.392)
hhhead_educ	0.023*** (0.007)	−0.000 (135.473)	−0.272** (0.111)
female_hhhead	0.141* (0.077)	0.000 (1,509.931)	1.959** (0.996)
Observations	14,512	14,512	197
Log Likelihood	−857.136	−0.00000	−16.460
Akaike Inf. Crit.	1,770.272	56.000	88.920

Note:

10 *p<0.1; **p<0.05; ***p<0.01

Table 10: Full sample probit regression results (poverty measure)

	<i>Dependent variable:</i>		
	attend (1)	register (2)	work_reason (3)
floods	0.001 (0.004)	−0.000 (81.750)	−0.052 (0.034)
flood_secondary	0.004 (0.005)	0.000 (85.082)	−0.010 (0.042)
flood_pov	0.006 (0.005)	0.00000 (82.309)	0.066* (0.038)
droughts	0.060*** (0.012)	0.00000 (177.609)	0.018 (0.145)
drought_secondary	−0.009 (0.012)	0.00000 (212.912)	−0.033 (0.127)
drought_pov	−0.029** (0.012)	−0.00000 (188.860)	−0.099 (0.145)
age	−0.101*** (0.010)	−0.00000 (197.682)	0.098* (0.059)
female	0.045 (0.047)	−0.00000 (950.190)	−0.708** (0.337)
extr	−0.008 (0.089)	0.00000 (1,739.178)	−0.583 (0.620)
secondary	0.323*** (0.099)	0.00000 (2,102.931)	0.273 (0.681)
child	0.504*** (0.078)	0.00000 (2,245.981)	−0.684* (0.387)
grandchild	0.460*** (0.111)	−0.00000 (2,786.191)	−1.408** (0.681)
num_children	0.029** (0.013)	−0.00000 (276.757)	0.092 (0.067)
hhhead_educ	0.034*** (0.006)	−0.000 (107.173)	−0.055 (0.036)
female_hhhead	0.128** (0.060)	−0.00000 (1,218.713)	1.203*** (0.338)
Observations	24,316	24,316	334
Log Likelihood	−1,504.793	−0.00000	−59.226
Akaike Inf. Crit.	3,065.586	56.000	174.453

Note:

Table 11: Rural sample probit regression results (poverty measure)

	<i>Dependent variable:</i>		
	attend (1)	register (2)	work_reason (3)
floods	−0.003 (0.007)	−0.000 (156.820)	−0.208 (2,443.399)
flood_secondary	0.005 (0.009)	−0.000 (166.770)	−0.719 (4,348.361)
flood_pov	0.019** (0.009)	0.000 (151.748)	0.826 (1,822.045)
droughts	0.064*** (0.023)	0.000 (374.694)	0.286 (7,950.599)
drought_secondary	0.035 (0.026)	0.000 (396.928)	5.352 (16,538.450)
drought_pov	−0.055** (0.024)	−0.000 (372.619)	−1.752 (8,019.697)
age	−0.107*** (0.016)	−0.000 (306.453)	0.897 (4,883.610)
female	0.076 (0.075)	−0.00000 (1,500.615)	−5.996 (17,842.050)
extr	0.208 (0.142)	−0.00000 (2,756.510)	−9.999 (21,340.790)
secondary	0.127 (0.160)	0.00000 (3,393.102)	−26.384 (76,041.240)
child	0.496*** (0.128)	0.00000 (3,704.243)	−2.453 (29,876.080)
grandchild	0.784*** (0.194)	0.00000 (4,554.215)	3.202 (52,177.900)
num_children	0.082*** (0.021)	−0.000 (399.868)	2.235 (6,869.127)
hhhead_educ	0.069*** (0.013)	−0.000 (213.485)	2.046 (2,729.461)
female_hhhead	0.165 (0.105)	−0.00000 (2,148.211)	26.809 (24,367.440)
Observations	9,804	9,804	137
Log Likelihood	−604.936	−0.000	−0.000
Akaike Inf. Crit.	1,265.872	56.000	56.000

Note:

12 *p<0.1; **p<0.05; ***p<0.01

Table 12: Urban sample probit regression results (poverty measure)

	<i>Dependent variable:</i>		
	attend	register	work_reason
	(1)	(2)	(3)
floods	0.001 (0.006)	−0.000 (101.249)	0.006 (0.050)
flood_secondary	0.002 (0.006)	−0.000 (100.741)	−0.106 (0.079)
flood_pov	0.004 (0.006)	−0.000 (105.600)	0.053 (0.058)
droughts	0.061*** (0.014)	0.000 (209.570)	−0.114 (0.311)
drought_secondary	−0.022 (0.014)	−0.000 (253.847)	−0.018 (0.310)
drought_pov	−0.017 (0.014)	−0.000 (238.465)	0.472 (0.389)
age	−0.101*** (0.013)	−0.000 (259.783)	0.150 (0.102)
female	0.018 (0.063)	−0.000 (1,229.459)	−0.252 (0.505)
extr	−0.249** (0.121)	0.000 (2,449.723)	−1.003 (1.211)
secondary	0.442*** (0.130)	0.000 (2,701.274)	1.313 (1.478)
child	0.530*** (0.102)	0.000 (2,838.594)	−1.392** (0.650)
grandchild	0.315** (0.140)	0.000 (3,546.432)	−2.217** (1.094)
num_children	−0.004 (0.018)	0.000 (391.309)	0.271** (0.135)
hhhead_educ	0.023*** (0.007)	0.000 (135.130)	−0.094 (0.058)
female_hhhead	0.167** (0.078)	0.000 (1,510.289)	0.694 (0.566)
Observations	14,512	14,512	197
Log Likelihood	−851.301	−0.00000	−28.609
Akaike Inf. Crit.	1,758.602	56.000	113.218

Note:

13 *p<0.1; **p<0.05; ***p<0.01

Table 13: Full sample probit regression results (region fixed-effects)

	<i>Dependent variable:</i>		
	attend	register	work_reason
	(1)	(2)	(3)
floods	0.012 (0.010)	0.000 (179.986)	0.052 (0.080)
flood_secondary	0.006 (0.005)	−0.000 (85.512)	−0.027 (0.041)
flood_lny	−0.003* (0.002)	−0.000 (31.218)	−0.012 (0.014)
droughts	0.005 (0.016)	0.000 (344.820)	−0.489 (0.323)
drought_secondary	−0.011 (0.011)	−0.000 (212.659)	−0.010 (0.139)
drought_lny	0.005 (0.003)	0.000 (60.942)	0.075 (0.057)
age	−0.100*** (0.010)	−0.000 (197.547)	0.076 (0.055)
female	0.045 (0.047)	−0.000 (950.039)	−0.724** (0.308)
lny	0.005 (0.029)	−0.000 (539.337)	0.054 (0.186)
secondary	0.302*** (0.096)	0.000 (2,104.016)	0.363 (0.662)
child	0.473*** (0.077)	0.000 (2,243.726)	−0.516 (0.344)
grandchild	0.434*** (0.109)	−0.000 (2,779.498)	−1.148* (0.639)
num_children	0.030** (0.013)	−0.000 (274.550)	0.098 (0.061)
hhhead_educ	0.035*** (0.006)	−0.000 (106.490)	−0.047 (0.033)
female_hhhead	0.123** (0.060)	−0.000 (1,220.087)	1.147*** (0.326)
mountains	0.191*** (0.060)	0.000 (1,210.087)	−0.506 (0.444)
plains	−0.321*** (0.062) ₁₄	0.000 (1,445.189)	−0.018 (0.308)
Observations	24,316	24,316	334
Log Likelihood	−1,528.352	−0.00000	−63.177

The following results show the region fixed-effects instead of department fixed-effects.

```
## Warning: glm.fit: algorithm did not converge
```

```
## Warning: glm.fit: algorithm did not converge
```

```
## Warning: glm.fit: algorithm did not converge
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
## Warning: glm.fit: algorithm did not converge
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

The following results show the linear regression models.

Discussion of Data

The patterns for households show that the average household has 5.3 members, and the average per capita monthly income per household is 258 bolivianos. Over half of the households in the sample are located in urban areas (56.3), while under half are located in rural areas (43.7). La Paz, Santa Cruz, and Cochabamba are the three departments with the most households in this sample, which corresponds to their overall population distribution.

The patterns in the weather data show that every department experienced multiple floods in 2005, while many but not all experienced droughts. The place that experienced the highest number of flood occurrences overall was Cochabamba, while Beni experienced 13 droughts in 2005.

Table 14: Rural sample probit regression results (region fixed-effects)

	<i>Dependent variable:</i>		
	attend (1)	register (2)	work_reason (3)
floods	0.028* (0.017)	0.00000 (262.659)	−4.603 (6,889.934)
flood_secondary	0.007 (0.008)	0.000 (167.511)	−1.123 (3,205.752)
flood_lny	−0.006** (0.003)	−0.000 (51.685)	0.538 (1,004.344)
droughts	−0.029 (0.026)	0.00000 (502.862)	0.260 (8,938.936)
drought_secondary	0.018 (0.023)	−0.00000 (396.983)	9.089 (4,661.592)
drought_lny	0.010* (0.005)	−0.00000 (100.535)	−0.802 (1,337.943)
age	−0.109*** (0.016)	−0.000 (305.814)	1.961 (2,039.812)
female	0.075 (0.074)	−0.000 (1,499.595)	−2.436 (7,747.984)
lny	−0.036 (0.046)	0.00000 (836.880)	5.958 (13,619.570)
child	0.504*** (0.126)	−0.00000 (3,701.264)	21.758 (22,510.770)
grandchild	0.772*** (0.192)	−0.00000 (4,539.550)	21.779 (52,671.430)
num_children	0.090*** (0.021)	−0.000 (397.637)	7.428 (4,349.785)
secondary	0.155 (0.154)	−0.000 (3,393.769)	−37.500 (28,551.710)
hhhead_educ	0.065*** (0.012)	−0.00000 (209.811)	3.937 (1,929.434)
female_hhhead	0.138 (0.104)	−0.00000 (2,148.262)	44.508 (26,242.280)
mountains	0.214** (0.089)	0.000 (1,781.028)	−20.813 (17,292.920)
plains	−0.311*** (0.101) ₁₆	−0.00000 (2,353.752)	−6.830 (12,401.100)
Observations	9,804	9,804	137
Log Likelihood	−618.593	−0.000	−0.000

Table 15: Urban sample probit regression results (region fixed-effects)

	<i>Dependent variable:</i>		
	attend	register	work_reason
	(1)	(2)	(3)
floods	0.004 (0.015)	0.000 (273.622)	0.046 (0.186)
flood_secondary	0.003 (0.006)	0.000 (101.139)	−0.106 (0.072)
flood_lny	−0.002 (0.003)	−0.000 (44.817)	−0.007 (0.029)
droughts	0.014 (0.024)	−0.000 (513.527)	−0.643 (0.979)
drought_secondary	−0.022* (0.013)	0.000 (253.199)	−0.098 (0.223)
drought_lny	0.004 (0.004)	0.000 (86.229)	0.104 (0.159)
age	−0.097*** (0.013)	0.00000 (259.792)	0.116 (0.077)
female	0.021 (0.062)	0.00000 (1,229.620)	−0.494 (0.436)
lny	0.041 (0.041)	0.000 (774.551)	−0.270 (0.485)
child	0.487*** (0.101)	−0.00000 (2,835.704)	−0.888* (0.489)
grandchild	0.294** (0.138)	−0.00000 (3,540.688)	−1.444 (0.879)
num_children	−0.014 (0.018)	−0.00000 (386.789)	0.206* (0.113)
secondary	0.416*** (0.125)	−0.00000 (2,702.744)	1.662 (1.158)
hhhead_educ	0.025*** (0.007)	0.000 (135.069)	−0.073 (0.050)
female_hhhead	0.144* (0.076)	−0.00000 (1,509.312)	0.534 (0.452)
mountains	0.202** (0.086)	−0.00000 (1,684.238)	−5.791 (348.428)
plains	−0.288*** (0.082) ₁₇	−0.00000 (1,869.289)	−0.279 (0.469)
Observations	14,512	14,512	197
Log Likelihood	−876.184	−0.00000	−33.612

Table 16: Full sample linear regression results

	<i>Dependent variable:</i>		
	attend (1)	register (2)	work_reason (3)
floods	0.001** (0.0003)	−0.000 (0.000)	0.001 (0.008)
flood_secondary	0.0002 (0.0001)	0.000 (0.000)	−0.0004 (0.004)
flood_lny	−0.0002*** (0.00005)	0.000 (0.000)	−0.0004 (0.001)
droughts	0.001 (0.001)	0.000 (0.000)	−0.015 (0.012)
drought_secondary	−0.00004 (0.0003)	−0.000 (0.000)	−0.0003 (0.009)
drought_lny	0.0003*** (0.0001)	0.000 (0.000)	0.001 (0.003)
age	−0.004*** (0.0003)	0.000 (0.000)	0.005 (0.005)
female	0.001 (0.001)	0.000 (0.000)	−0.062** (0.030)
lny	0.0004 (0.001)	−0.000 (0.000)	0.005 (0.019)
secondary	0.014*** (0.003)	−0.000 (0.000)	0.019 (0.065)
child	0.027*** (0.003)	−0.000 (0.000)	−0.058 (0.044)
grandchild	0.025*** (0.004)	0.000 (0.000)	−0.076 (0.061)
num_children	0.001** (0.0004)	0.000 (0.000)	0.011 (0.007)
hhhead_educ	0.001*** (0.0002)	0.000 (0.000)	−0.003 (0.003)
female_hhhead	0.005** (0.002)	0.000 (0.000)	0.116*** (0.036)
Observations	24,316	24,316	334
R ²	0.027	0.500	0.144
Adjusted R ²	0.026	0.499	0.068
Residual Std. Error	0.115 (df = 24288)	0.000 (df = 24288)	0.250 (df = 306)
F Statistic	25.279*** (df = 27; 24288)	1899.558*** (df = 27; 24288)	1.906*** (df = 27; 306)

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 17: Rural sample linear regression results

	<i>Dependent variable:</i>		
	attend (1)	register (2)	work_reason (3)
floods	0.0001 (0.0002)	0.000 (0.000)	−0.004 (0.004)
flood_secondary	0.00000 (0.0003)	−0.000 (0.000)	0.0003 (0.010)
droughts	0.002*** (0.0004)	−0.000*** (0.000)	−0.026*** (0.008)
drought_secondary	0.001 (0.001)	0.000 (0.000)	0.035* (0.021)
age	−0.004*** (0.0005)	−0.000 (0.000)	0.008 (0.009)
female	0.002 (0.002)	−0.000 (0.000)	−0.053 (0.040)
lny	−0.002* (0.001)	0.000 (0.000)	0.007 (0.014)
secondary	0.009* (0.005)	0.000 (0.000)	−0.190 (0.116)
child	0.030*** (0.006)	0.000 (0.000)	0.031 (0.059)
grandchild	0.039*** (0.007)	0.000 (0.000)	0.096 (0.097)
num_children	0.003*** (0.001)	−0.000 (0.000)	0.009 (0.013)
hhhead_educ	0.002*** (0.0003)	0.000 (0.000)	0.009 (0.007)
female_hhhead	0.004 (0.003)	−0.000 (0.000)	0.274*** (0.060)
Observations	9,804	9,804	137
R ²	0.025	0.500	0.347
Adjusted R ²	0.023	0.499	0.199
Residual Std. Error	0.116 (df = 9778)	0.000 (df = 9778)	0.211 (df = 111)
F Statistic	10.121*** (df = 25; 9778)	391.120*** (df = 25; 9778)	2.356*** (df = 25; 111)

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 18: Urban sample linear regression results

	<i>Dependent variable:</i>		
	attend (1)	register (2)	work_reason (3)
floods	−0.0003** (0.0001)	0.000 (0.000)	0.0001 (0.003)
flood_secondary	0.0001 (0.0002)	0.000 (0.000)	−0.003 (0.004)
droughts	0.003*** (0.0003)	0.000 (0.000)	−0.007 (0.009)
drought_secondary	−0.0002 (0.0004)	0.000 (0.000)	−0.006 (0.011)
age	−0.004*** (0.0004)	0.000 (0.000)	0.007 (0.007)
female	0.001 (0.002)	0.000 (0.000)	−0.062 (0.042)
lny	0.001 (0.001)	0.000 (0.000)	−0.014 (0.019)
child	0.026*** (0.004)	−0.000*** (0.000)	−0.112* (0.066)
grandchild	0.017*** (0.005)	−0.000*** (0.000)	−0.133 (0.082)
num_children	−0.001 (0.001)	−0.000* (0.000)	0.018* (0.009)
secondary	0.017*** (0.004)	−0.000 (0.000)	0.088 (0.089)
hhhead_educ	0.001*** (0.0002)	0.000 (0.000)	−0.006 (0.004)
female_hhhead	0.005** (0.002)	−0.000 (0.000)	0.058 (0.050)
Observations	14,512	14,512	197
R ²	0.034	0.500	0.202
Adjusted R ²	0.032	0.499	0.085
Residual Std. Error	0.114 (df = 14486)	0.000 (df = 14486)	0.262 (df = 171)
F Statistic	20.168*** (df = 25; 14486)	579.439*** (df = 25; 14486)	1.727** (df = 25; 171)

Note:

*p<0.1; **p<0.05; ***p<0.01